Speech of Mr. J. A. Pearce, of Maryland, on the subject of the Coast Survey of the United States. Delivered in the Senate of the United States, on Saturday, Feb. 17, 1849. Washington, 1849. 8vo.—*From the Hon. J. A. Pearce.*

Pending nominations, Nos. 226, 227 and 228, were read.

Stated Meeting, March 16.

Dr. PATTERSON, President, in the Chair.

Present, seventeen members.

Prof. Agassiz, a member of this Society, was introduced, and took his seat.

A letter was received and read:—

From A. D. Bache, Superintendent U. S. Coast Survey, announcing the transmission to this Society of certain Maps, executed under the direction of the Survey.

The following donations were announced:—

FOR THE LIBRARY.

Second Annual Report of the Regents of the University of the State of New York, on the Condition of the State Cabinet of Natural History; with Catalogues of the same: Made to the Senate, January 12, 1849. Albany. 8vo.—*From the Regents of the University of the State of New York.*

Three Maps of Delaware River and Bay, one of Nantucket Harbour, and one of the Harbours of Cawkins and Sheffield Islands. —*From the Superintendent of the U. S. Coast Survey, through the Hon. J. R. Ingersoll.*

Report of the Committee of Congress to whom was referred the Memorial of William T. G. Morton, asking Compensation from Congress for the Discovery of the Anæsthetic or Pain-subduing Property of Sulphuric Ether. Made to the House of Representatives, Feb. 23, 1849.—*From the Hon. M. C. D.*

The American Journal of Science and Arts. Conducted by Professors B. Silliman and B. Silliman, Jr. and James D. Dana. Second Series, No. 20, March, 1849. New Haven. 8vo.—*From the Editors.*

The African Repository and Colonial Journal. Vol. XXV. No. 3.

March, 1849. Washington. 8vo.—*From the American Colonization Society.*

Journal of the Franklin Institute. Third Series. Vol. XVII. No. 3. March, 1849. Philadelphia. 8vo.—*From the Institute.*

The Medical News and Library. Vol. VIII. No. 75. March, 1849. Philadelphia. 8vo.—*From Lea & Blanchard.*

An Inquiry into the alleged tendency of the Separation of Convicts, one from the other, to produce Disease and Derangement. By a Citizen of Pennsylvania. Philadelphia, 1849. 8vo.—*From the Philadelphia Society for the Alleviation of the Miseries of Public Prisons.*

Annals and Magazine of Natural History, including Zoology, Botany, and Geology. Vol. III. No. 13. January, 1849. London. 8vo.—*From Sir William Jardine, Bart.*

Dr. Patterson, in the name of Prof. A. D. Bache, laid before the Society, an abstract of a report, made by Mr. Sears C. Walker, of the results of the telegraphic operations of the U. S. Coast Survey, made by him on the 23d January last, between Washington and Philadelphia, New York and Cambridge, Mass. A letter from Prof. Bache to Dr. Patterson, accompanying the report, was read by Prof. Kendall.

Washington, March 1, 1849.

Dear Sir,—Will you please communicate to the American Philosophical Society a brief abstract of a Report made to me on the 21st ultimo, of the results of the Telegraph operations of the U. S. Coast Survey, made on the 23d of January last, between Washington, Philadelphia, New York and Cambridge, Mass., by Mr. Sears C. Walker, assistant, having charge of the Telegraph operations.

The object in view was to test the practical working of the method of imprinting the dates of star transits on a graduated clock register. The three astronomical stations, selected for the occasion, were the Philadelphia Observatory, under the direction of Prof. Kendall; the New York City station, in the private residence of Dr. L. M. Rutherford, under Prof. E. Loomis; and the Harvard Observatory, Cambridge, under Prof. Wm. Cranch Bond.

In conformity with the plan of his Report of December 15, 1849, duplicate records were kept at the Washington Northern Telegraph office, by Mr. Walker and myself.

The astronomical clock was located at Philadelphia, and rated for

several days by Prof. Kendall. It contained two tilt-hammer *electrotomes*, one invented by Mr. J. J. Speed, jun., of Ithaca, N. Y., in 1847, attached to the minute wheel, and giving its signals every two and a half minutes. The other (used for the occasion) was on the plan invented by Dr. Locke, in 1848, and attached to the escapement-wheel. The automatic clock register was graduated to two seconds, usually occupying an inch of paper of the Morse's registering fillet.

Mr. Walker reports, that a comparison of sixty records, made by the two registers at Washington, shows that the probable error of the mechanical operation of printing and reading off, is only about fifteen-thousandths of a second.

This confirms the estimate of accuracy of the work made by him in his report of Dec. 15th last, viz., of a hundredth of a second for the case of an automatic register of single seconds, with an inch of paper to each.

It further appears, from the Report, that when the star-signals were given at Philadelphia, so that the clock and signal-waves had the same local origin, all the registers at all the stations, marked alike, within such limits as were indicated by the probable error just mentioned.

When, however, the star-signals were given at New York, small, but appreciable, differences were noticed in the respective readings of the apparent date, of the same event as recorded at the different stations. This discrepancy was still greater for the case of the Cambridge star-signals, the graduating clock remaining always at Philadelphia.

The following table contains the mean excess of the readings of the date of each event in the time of the Philadelphia automatic clock at each station, over that of each of the others, with the number of single results, and the probable accidental error from the source already referred to. The stations compared are denoted by their initials. Those marked *W*, are for the mean of the two records made at Washington. A further revision of these quantities may somewhat change their amounts.

Two kinds of readings were made, viz., *break circuit* signal readings on a *break circuit clock scale*, and *make circuit* signal readings, on a *make circuit clock scale*.

The excesses indicated by the mean of the two series of readings for the two scales, with the number of results and probable error of each, are reported as follows. The times A, B, C and D, respectively de-

note the time of passage of the galvanic wave between W and P, P and N, N and C, C and W.

For reasons connected with the analytical theory of longitudes, by Telegraph operations, as published in Mr. Walker's report of Nov. 10, 1847, and in the recent report of the 21st ultimo, the mean of the two series is the most plausible value that can be derived from the printed record. The residual quantities do not appear to be explicable by any admissible value of relative times of operations, of the spiral spring and receiving magnet, armature. Neither do they appear to be explained by any reasonable hypothesis of relative changes of apparent dates from changes of permanent magnetism, as it is called, by change of locality of signal station. The analytical theory of this subject was given by Mr. Walker, Dec. 28, 1847, in his Report on the Telegraph operations of 1847.

These several sources of error are nearly all eliminated by the manner of forming the residuals of these tables, and being in their nature periodical, disappear in the average of all the results. It may also be remarked, that the outward and inward armature times of the magnets of the local registers, are relatively annulled by their having the same value for the clock and signal electrotomes.

According to Mr. Walker's report, these residual quantities, from change of relative place of origin of the clock and signal waves, may all be explained by the hypothesis that the time of propagation of the galvanic wave from the place of the clock or star signal stations, to that of the receiving register, though small, is not quite insensible. A solution of the eighteen equations of condition formed on this hypothesis, by Mr. Walker, give, for the velocity of the propagation of the galvanic wave, through the compound circuit, eighteen thousand eight hundred miles per second, with a probable *accidental* error, as stated by him, of about one thousand miles. The statistics are too incomplete to warrant any discrimination between the times of propagation of the wave through the different kinds of media, viz., the wires, the batteries, (three in number,) and the ground. After applying the values of the wave-times by this hypothesis, and with this velocity in the different portions of the whole circuit of one thousand and fifty miles, no sensible discrepancy remains, the residual terms being not greater than their probable errors, from the comparison of the two Washington registers. All the readings now harmonize as well as if all the clock and star signals, and all the printed records had been made in the same place.

The result is one of much interest to the progress of science, and of special importance in the longitude operations of the Coast Survey.

The value apparently attributable to wave time, is too great to be neglected in telegraph operations for longitudes intended to be used as data in connexion with geodetical measurements. A more extensive series of operations, with more complete mechanical arrangements, will be undertaken in the course of the coming season.

Very truly yours,

A. D. BACHE.

DR. R. M. PATTERSON,
Pres. American Philos. Society.

TABLE OF RELATIVE DISTANCES.

No.	Star Signal Station.	Receiving Station Compared.	Wave Time.	Relative miles traversed by Clock and Signal Waves.
1	Philadelphia	P — W	0	0
2		P — C	0	0
3		P — N	0	0
4		W — C	0	0
5		W — N	0	0
6		N — C	0	0
7	Cambridge	P — W	A + B + C — D	150
8		P — C	2 B + 2 C	900
9		P — N	2 B	400
10		W — C	— A + B + C + D	750
11		W — N	— A + B — C + D	250
12		N — C	2 C	500
13	New York	P — W	0	0
14		P — C	2 B	400
15		P — N	2 B	400
16		W — C	2 B	400
17		W — N	2 B	400
18		N — C	0	0

Conditional Equations.

No.	Conditional Equations, $0 = a\,x + n$.	Weight. W.	$W\,a$.	$W\,n$.	Residual Error, $a\,x + n = \varepsilon$	Probable Error. ε'	$W\,\varepsilon\,\varepsilon$	Remarks.
				s	s	s	s	
1	$0 = 0 - 0.0029$	17	0	-0.0493	-0.003	± 0.006	0.00015	x = Wave Time for 100 miles.
2	$= 0 - .0015$	10	0	$-.0150$	-0.002	7	4	$x = 0.005629 \pm 0.000302$
3	$= 0 + .0038$	8	0	$+.0304$	$+0.004$	7	13	
4	$= 0 + .0075$	12	0	$+.0900$	$+0.007$	6	59	$E = \pm 0.00435$
5	$= 0 - .0047$	10	0	$-.0470$	-0.005	7	25	
6	$= 0 + .0070$	5	0	$+.0350$	$+0.007$	10	2	
7	$= 1.5 \times x - .0117$	21	31.5	$-.2457$	-0.003	4	19	$\frac{10.5}{x} = 18690$ miles ± 1000
8	$= 9.0 \times x - .0453$	17	153	$-.7701$	$+0.005$	5	42	= miles of wave per second.
9	$= 4.0 \times x - .0115$	10	40	$-.1150$	$+0.011$	7	121	
10	$= 7.5 \times x - .0386$	24	180	$-.9264$	$+0.003$	4	22	$\Sigma\, W\,n\,n = 0.12547$
11	$= 2.5 \times x - .0144$	16	40	$-.2304$	$+0.000$	5	0	
12	$= 5.0 \times x - .0442$	12	60	$-.5304$	-0.016	6	307	$\Sigma\, W\,\varepsilon\,\varepsilon = 0.00862$
13	$= 0. + .0007$	9	0	$+.0063$	$+0.001$	8	1	
14	$= 4.0 \times x - .0192$	6	24	$-.1152$	$+0.003$	7	5	
15	$= 4.0 \times x - .0314$	7	28	$-.2198$	-0.008	8	45	
16	$= 4.0 \times x - .0225$	8	32	$-.1800$	$+0.000$	7	0	
17	$= 4.0 \times x - .0300$	10	40	$-.3000$	-0.008	7	64	
18	$= 0. + .0158$	6	0	$+.0948$	-0.014	0.008	118	
		208	628.5	$+3.5374$	-0.018		0.00862	
					± 0.100	± 0.119		

Dr. Elwyn called the attention of the Society to the proposals by Dr. Darlington, of West Chester, to publish, by subscription, Memorials of John Bartram and Humphrey Marshall, "the eminent Pennsylvania Horticulturists, Botanists, and Naturalists," with occasional notes and biographical sketches.

Pending nominations, Nos. 226, 227, and 228, were read.